

EAT-Lancet – is there such a thing as ‘one-size-fits-all’ sustainability?

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It was an honour to present on this subject at the inaugural Real Food Gathering in April 2019, in a marquee on an organic farm in the wilds of the Glastonbury Valley in Somerset, in the midst of howling gales gifted by Storm Hannah. Over the last four decades, as both an academic and a campaigner, I have explored sustainability as applied to the environment, food production systems and human health. I have worked in diverse settings in Europe, sub-Saharan Africa, Central Asia, South-East Asia, Australia and the US. Insights from this work make me deeply concerned about the centralised, integrated approach proposed by EAT-Lancet that has the potential to benefit the world's largest agrifood businesses more than either the natural environment or human health.

The EAT-Lancet Commission was formed with the recognition that food systems have the potential to nurture both human health and the environment, yet are currently negatively impacting both. This paper is a critique of the EAT-Lancet report, published in January 2019, which proposes a global 50% cut in consumption of red meat and sugar, and a doubling of consumption of nuts, fruits, vegetables and legumes. The critique emphasises the weaknesses of any one-size-fits-all approach based on evaluation of published literature, its clash with traditional eating cultures and production systems, and, ultimately, its potential to fail to deliver on its promises.

Introduction

January 2019 saw the publication of a Lancet Commission study that attempted to provide a global solution for dietary and planetary sustainability (Willett *et al*, 2019). The 47-page, 357-reference article, *Food in the Anthropocene: the EAT-Lancet Commission on healthy diets from sustainable food systems*, was a product of more than two years of deliberation by a Lancet Commission led by Harvard's Professor Walter Willett and Stockholm Resilience Centre's Professor Johan Rockström. They were supported by 17 scientific experts and 20 co-authors. The work was carried out in conjunction with the Norway-based EAT Forum (2019a), a non-governmental organisation 'dedicated to transforming our global food system through sound science, impatient disruption and novel partnerships' (EAT Forum, 2019b).

The EAT-Lancet Commission proposes a global transformation of food systems that set boundaries, limits and estimates for foods humans should eat and what foods should be cultivated in order to nurture both human health and the environment.

The proposal is deemed fit for the expected 10 billion population expected by 2050. The EAT-Lancet report sought to provide an integrated framework, a series of scientific targets, and a battery of soft and hard levers that should be used by policy-makers, the food industry, agricultural producers and the global public to help catalyse a transition toward sustainable food consumption and production patterns.

While the report was widely acclaimed by the world's media, criticisms have subsequently emerged, including by the Sustainable Food Trust (2019), through my own critique (Verkerk, 2019), and by a subsequent decision by the World Health Organization to withdraw its support (Torjesen, 2019).

While there are many aspects of the EAT-Lancet report that are widely agreed, the primary purpose of this paper is to focus on areas of uncertainty, weakness, controversy or disagreement. Ultimately, the goal is to encourage debate so that rational, proportionate, individualised and location-specific ways forward can be established for both producers and consumers in different parts of the world.

The planetary health diet and human health implications

The EAT-Lancet Commission proposes a universally-applicable daily reference diet, referred to by the EAT Forum as the ‘planetary health diet’, that includes target intakes as well as ranges for eight distinct food groups (Table 1, opposite).

Among the reference diet’s most notable features are:

- Average proposed daily intakes for adults are given for eight food groups (incorrectly referred to as ‘macro-nutrients’) along with wider intake ranges to take into account social and cultural differences and diversity.
- Zero to relatively small amounts of meat are proposed (an average of 43g of beef, lamb, pork and poultry, comprising 3.7% of daily energy). This contrasts with present levels of meat consumption in the US of 128g a day (Daniel, 2011).
- The reference diet proposes a greater energy ‘allowance’ for sugar (120 kcal) than for beef, lamb, pork, chicken, other poultry, and eggs combined (111kcal energy).
- The proposed ‘added sugars’ allowance is the equivalent to more than seven teaspoons of added sugar every day (about 5% of daily energy intake).
- The reference diet proposes limited intakes of starchy vegetables, contrary to most current government guidelines.
- Very limited intake of saturated fats (added animal fats limited to 5g a day, equivalent to 1.4% of daily energy) are advised.
- The report proposes that palm oil, currently the second most commonly consumed dietary fat worldwide, should be limited to a maximum of just 6.8g a day (2.4% of daily energy).
- The proposed substitution of plant oils for animal fats will probably lead to n-6 to n-3 polyunsaturated fatty acid (PUFA) ratio that is strongly n-6 dominant given the lack of stipulated n-3 sources and the high n-6 content of unsaturated plant oils.
- The reference diet proposes a surprisingly low average ratio of vegetables to fruit (fresh weight) of 3:2, although a maximum of 6:1 is possible if the maximum intake of vegetables and the minimum of fruit shown in the ranges is consumed.
- It recommends a 32% contribution of daily energy from whole grains (34% from all starchy carbohydrates).
- It proposes only 8% of the daily energy contribution from all vegetables and fruit.
- The report proposes the addition of an average of 250ml a day of whole milk or derivative equivalents of dairy products (equivalent to about 25–40g of cheese), although it also allows for zero intake for those who are dairy intolerant.

While the EAT-Lancet report proposes significant reductions in consumption of red meat, sugars and highly refined carbohydrates, the proposed high intakes of n-6 relative to n-3 PUFAs, grains and starchy carbohydrates are not substantially dissimilar from current eating patterns in industrialised countries such as the UK (NDNS, 2018).

Furthermore, the presentation of the reference diet by the EAT Forum (EAT Forum, 2019c) is misleading. In its diagrammatic representation (Figure 1A), fruit and vegetables are denoted by fresh weight, and in the same figure, the remaining seven food groups are shown by energy contribution, the mixing of units in the same figure being misleading. Figures 1B and 1C represent the EAT-Lancet reference diet by fresh weight and energy contribution, respectively. These latter diagrams show that the reference diet is relatively close to current government guidelines, that are described by Harcombe (2017) as being designed more for food industry wealth than for public health. As shown by the latest data on adult consumption patterns (NDNS, 2018), compliance with the guidelines has also improved significantly since 2012 (Harland *et al*, 2012), yet obesity, type 2 diabetes and related conditions have continued to soar.

Taken together, it is unlikely that the escalating rates of non-communicable diseases, particularly in relation to heart disease, obesity and type 2 diabetes, could be reversed with the proposed dietary pattern which could hardly be described as ‘anti-inflammatory’ (Biobaku *et al*, 2019).

Furthermore, the reference diet is based on 2,500 kcal (10,460 kJ) daily intakes, which does not take into account caloric restriction which has been linked to reduced incidence of preventable chronic diseases (Lee and Longo, 2016). The EAT-Lancet report also avoids any consideration of food frequency or intermittent fasting, the ‘how’ we eat having been shown to be at least as important as ‘what’ we eat (Miller *et al*, 2018; Templeman *et al*, 2019). Furthermore, with carbohydrate intakes, maintained at around 35% of total energy intake, the EAT-Lancet reference diet ignores extensive clinical evidence and emerging published evidence for the benefits of carbohydrate-restricted diets, especially among overweight, obese, type 2 diabetic or prediabetic individuals (Zafar *et al*, 2019).

However, many of these assumptions are based on the average values proposed, and not the ranges. It is therefore important to evaluate the potential health implications of different interpretations of the reference diet, based on the flexibility offered by the ranges. It also worth pointing out that widespread public adoption of dietary patterns at the limits of these ranges may alter quite dramatically the relevance of the EAT-Lancet Commission’s findings as well as its recommendations. Examples include widespread consumption of the minimum amount (200g per capita) of all types of vegetables per day, or maximum consumption of animal protein sources (211g per capita daily from beef, lamb, pork, chicken and other poultry, eggs and fish).

Table 1. EAT-Lancet reference diet/planetary health diet by food group and recommended daily intake (grams fresh weight and by energy [kcal])










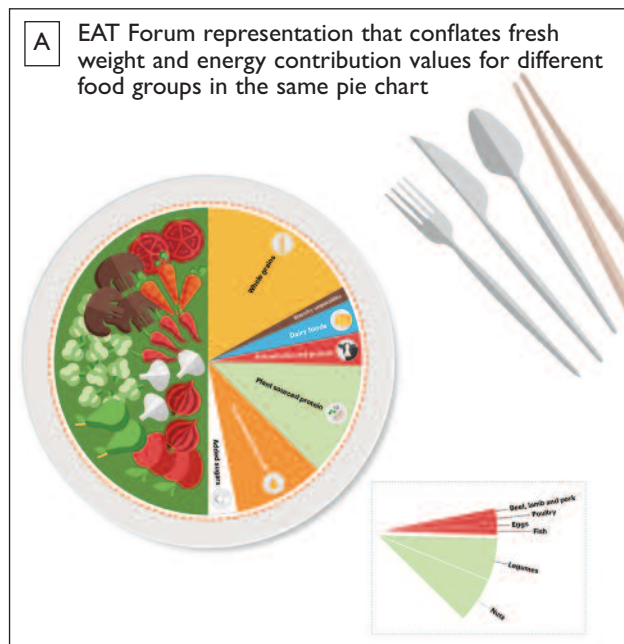
THE PLANETARY HEALTH DIET <i>aka “healthy reference diet”</i>		FOOD GROUP INTAKE (POSSIBLE RANGE), G/DAY	CALORIC INTAKE, KCAL/DAY	% ENERGY CONTRIBUTION
	Whole grains			
	Rice, wheat, corn and other	232 (total grains 0-60% of energy)	811	32.4
	Tubers or starchy vegetables			
	Potatoes and cassava	50 (0-100)	39	1.6
	Vegetables			
	All vegetables	300 (200-600)	..	n/a
	Dark green vegetables	100	23	0.9
	Red and orange vegetables	100	30	1.2
	Other vegetables	100	25	1.0
	Fruits			
	All fruit	200 (100-300)	126	5.0
	Dairy foods			
	Whole milk or derivative equivalents (eg, cheese)	250 (0-500)	153	6.1
	Protein sources			
	Beef and lamb	7 (0-14)	15	0.6
	Pork	7 (0-14)	15	0.6
	Chicken and other poultry	29 (0-58)	62	2.5
	Eggs	13 (0-25)	19	0.8
	Fish	28 (0-100)	40	1.6
	Legumes			
	Dry beans, lentils and peas	50 (0-100)	172	6.9
	Soy foods	25 (0-50)	112	4.5
	Peanuts	25 (0-75)	142	5.7
	Tree nuts	25	149	6.0
	Added fats			
	Palm oil	6.8 (0-6.8)	60	2.4
	Unsaturated oils	40 (20-80)	354	14.1
	Dairy fats (included in milk)	0	0	0.0
	Lard or tallow	5 (0-5)	36	1.4
	Added sugars			
	All sweeteners	31 (0-31)	120	4.8

Figure 1. Three different representations of the recommended daily intake of different food groups as proposed in the EAT-Lancet reference (planetary health diet), based on a daily energy intake of 2,500 kcal (10,460 kJ)

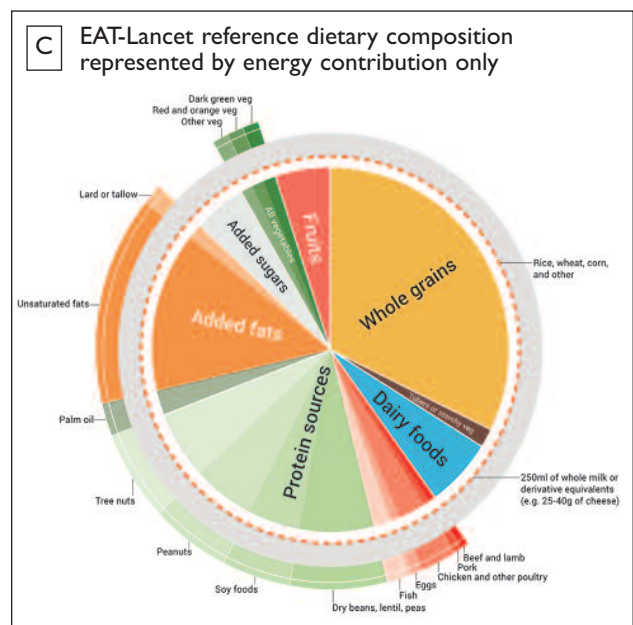
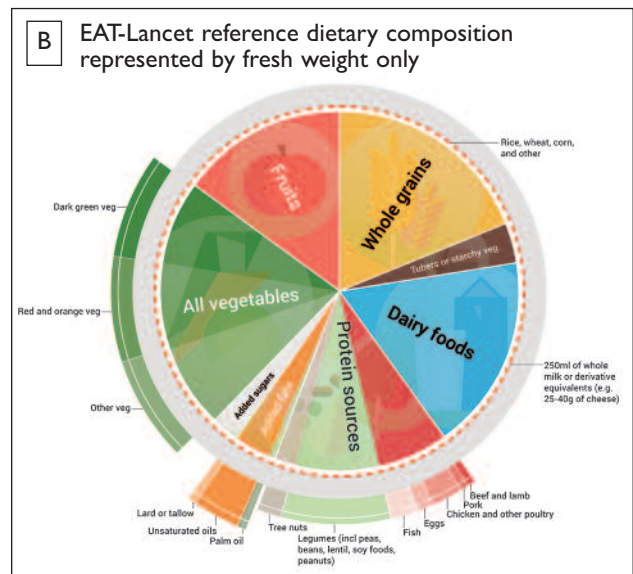


Exploring the flexibility of the planetary health diet

We conducted a detailed scenario analysis in which the nutrient composition of three types of ‘flexitarian’¹ and vegan diets for which specific foods were selected in amounts compliant with the reference diet were compared (Verkerk, 2019). Nutrient contents were determined from data in the USDA National Nutrient Database for Standard Reference (<https://ndb.nal.usda.gov>). The three types were characterised as ‘basic’ (assuming typical interpretations, using average amounts), ‘lower carb’ (common and popular among those with metabolic issues and seeking weight reduction) and ‘higher protein, physically active’ (given that the average protein stipulation in the reference diet is inadequate and has not been optimised for physically active individuals (Slater and Phillips, 2011; Stellingwerff *et al*, 2011)).

The following conclusions could be drawn from the scenario analysis:

- Protein intakes ranged from a minimum of 8.7% of total energy for the ‘higher protein, physically active’ vegan diet to 11.3% of total energy for the ‘lower carb’ ‘flexitarian’ diet.
- The protein intakes for all three vegan scenarios (based on a 70kg adult) were below the consensus levels set for adult humans established by an international expert group in 2007 (Joint WHO/FAO/UNU Expert Consultation 2007).



- Despite including the minimum amounts proposed in the reference diet, the protein intake in one of the vegan scenarios (‘lower carb’) was below the level considered adequate even by the EAT-Lancet authors.
- The amino acid profiles in the vegan scenarios may be incomplete for some individuals, particularly those who are immunologically challenged, with a higher arginine requirement (Daly *et al*, 1990).
- Total energy intake from carbohydrates could be varied by different dietary compositions from 33% (‘flexitarian’ ‘higher protein, physically active’) to 52% of total energy (vegan, ‘basic’).
- The contribution of daily energy from whole grains could be varied from 20% (flexitarian ‘higher protein, physically active’) to 35% (flexitarian, ‘basic’), the latter, not the former, being close to the EAT-Lancet target of 32%.

¹ As used here, a ‘flexitarian’ diet focuses on healthy plant proteins and other whole, minimally processed plant-based foods with the inclusion of low to moderate amounts of animal-derived products.

- Given the relatively large intakes of plant foods, dietary fibre intakes in all scenarios readily met the 30g per day target (range: 35–53g) set in the landmark study by (Reynolds *et al*, 2019).
- The vegan diets are likely to be deficient in a wide range of micronutrients, including vitamin A (retinol) (Kristensen *et al*, 2015), haem iron (Miller, 2013), vitamin B12 (Gilsing *et al*, 2010) and long-chain omega-3 fatty acids (notably eicosapentaenoic acid (EPA), and docosahexaenoic acid (DHA) (Burdge *et al*, 2017).
- High levels of phytic acid may prevent adequate absorption of zinc, copper and iron (Lim *et al*, 2013).
- Replacing animal-based foods with vegan ones may illicit adverse reactions in sensitive individuals, owing to increased intakes of gluten (Schneidl *et al*, 2018), anti-nutritional factors such as lectins (Miyake *et al*, 2007), phytate (Schlemmer *et al*, 2009), goitrogens (Felker *et al*, 2016) and oxalates (Prezioso *et al*, 2015).
- The EAT-Lancet recommendations do not adequately take into account adaptations of specific sub-populations to particular diets and the potential impacts on the microbiome, especially of the gut (Gupta *et al*, 2017) that can be associated with dietary transformation.
- The Lancet-Commission authors continue to maintain an anti-saturated fat stance, contradicting the recent changes in the scientific consensus on the subject (Fattore and Massa, 2018; Zhu *et al*, 2019). The authors also do not adequately address the evidence for the pro-inflammatory nature of diets in which a high dietary n-6: n-3 polyunsaturated fatty acid (PUFA) ratio contribute to metabolic diseases (Torres-Castillo *et al*, 2018).
- The EAT-Lancet authors make a strong case for increased use of oilseed rape (canola) because of its provision of essential fatty acid alpha-linolenic acid (ALA). Twenty-five per cent of the world's oilseed rape is genetically modified, the vast majority of this being grown in Canada, the US and Australia (Belter, 2016), with a consequent increase in herbicide-resistant weeds (Fernando *et al*, 2016).
- The data that the EAT-Lancet Commission has relied on to draw its conclusions are based on long-term studies involving mortality (not morbidities or comorbidities), many of which are based on consumption patterns that precede the era of widely available globalised, ultra-processed foods. Additionally, there are major, ongoing dietary transitions associated with increasingly urbanised populations, such as the consumption of increasing amounts of food outside of the home, which generally has been shown to be detrimental to health compared with food preparation in the home (Nago *et al*, 2014). Accordingly, the findings may not be relevant to consumption patterns required to reduce morbidities and mortalities in the current or future eras.

Greening agriculture?

The EAT-Lancet's environmental protection and agricultural sustainability goals are laudable. They include climate change mitigation, conversion of agricultural systems from net carbon emitters to net carbon sinks, water conservation, improved nutrient recycling, and enhancement of biodiversity. All of this, says the EAT-Lancet Commission, is to be achieved through great strides in efficiency in the use of fertilisers and land – with no additional land use over that presently used for agriculture.

Despite growing awareness about the health of plant-based diets and adverse impacts of factory farming of animals over the last decade or more, there has been no slowing in demand for livestock products, a trend that is strongly linked to growing affluence. The World Health Organization (WHO) projects that annual meat production will increase to 376 million tonnes by 2030, a 72% increase from 1999 (WHO, 2019).

The proposal to halve meat consumption globally met with an expected negative reaction from the meat industry. However, the EAT-Lancet authors – as is often the case with desk-based research projects reliant on macro data – have failed to take into account the profound differences that livestock production systems can have depending on whether they operate as part of industrial farming or agroecological systems.

Marginal lands

Parts of the USA, Russia and Australia, for example, have relatively large amounts of marginal land that is suitable for grazing, but not for arable or horticultural production. In fact, the concept of ‘marginal land’, in which land is considered marginal for agriculture, but vital for grazing, is integral to any large-scale, holistic, sustainable agro-ecosystems model (Shahid and Shankiti, 2013). Dry land, much of it viewed as marginal, represents 45% of the world's land area and the role of livestock to aid the ‘upcycling’ of such land is viewed as increasingly important for the future of food, people and planet. Ironically, as the Global Dry Land Alliance (GDLA) member countries are only too well aware, the trend towards salinisation and desertification of dry lands is actually reducing available arable land, and increasing land suitable for grazing and restoration for mixed uses.

Maintaining ideology, avoiding reality

The EAT-Lancet report avoids some of the most thorny questions around intensification of agriculture production systems, including the centralisation of agricultural resources (eg seeds, fertilisers), increased use of genetically modified (GM) crops and associated pesticides (eg glyphosate), and the impacts of pesticides on non-target organisms including pollinators and humans. These were among the issues considered as crucially significant in the five-year, seminal findings of the International Assessment

of Agricultural Knowledge, Science and Technology for Development (IAASTD, 2009) which, based on five years of research by 400 scientists from 60 countries, favoured transition towards decentralised, locally-adapted, agro-ecological models.

There remains considerable confusion over the extent of agriculture’s contribution to greenhouse gas emissions, the EAT-Lancet report authors relying on Vermeulen *et al*’s (2012) estimate of ‘up to 30%’ contribution to greenhouse gas emissions. By contrast, the US Environmental Protection Agency (EPA, 2018) estimates the contribution at just 9% of the total amount, with 28% linked to transportation, 22% to industry and 28% to electricity generation. The contribution from live-stock is estimated at just 4.2%, comprising 2.2% from beef, 1.4% dairy, 0.5% swine and 0.1% from poultry.

By contrast, New Zealand, with just 4.6 million human population and more than twice that many cattle, is estimated to produce 46% of its greenhouse gases from agriculture, with electricity production contributing nearly the same amount, at 42% (NZ Ministry for the Environment, 2014). So while per capita greenhouse gas emissions are a stunning 16 times over the global sustainable rate of 1 ton of CO₂-equivalent per person, New Zealand, by virtue of its small population, is well outside the top 20 greenhouse gas emitting countries. In order to reaffirm the need for prioritisation, New Zealand’s emissions represent just 1.7% those of China and 3.4% those of the US.

Global versus local

Given that a central tenet of EAT-Lancet is to reduce global consumption of red meat by over 50% ostensibly to reduce greenhouse gas emissions, we calculated, using FAO data, the relative impact of animal protein intake per country, taking into account per capita animal protein intake and population sizes (Verkerk, 2019). This analysis showed that just three countries (China, the US and India) contributed to 67% of the global impact, assuming equivalence of impact per gram of animal protein consumed. This emphasises the need to focus on regional and local solutions, as opposed to global ones that inevitably encourage further globalisation and centralisation of resources, a trend being widely considered as counter to environmental, cultural and social diversity and sustainability (der Ploeg, 2012).

Concluding remarks

Views about the most sustainable nutritional and agricultural practices are increasingly being informed by desk-based researchers and policymakers with strong belief systems and ideologies, but who have little practical experience either of nutrition or sustainable agriculture in diverse ecotypes.

Data on which views are based is often derived from meta-analyses or systematic reviews, whose original data

may be many decades old and so no longer relevant to current or future scenarios. During the analysis and interpretation of results, association is often incorrectly taken to imply causation. When the results are published, media channels that support the ideologies spin the findings further – and the public does its best to pick up the pieces and integrate them with its own knowledge, experience and belief systems.

The EAT-Lancet project is, in our opinion, a case in point. The much-publicised research paper by Poore and Nemecek (2018), which has been used as a justification to vilify animal-based foods, is another. With an ideology in place, it is very easy to look past the full range of factors that require consideration if truly sustainable approaches are to be found. That might include, for example, the consideration of biodiversity loss (eg small mammals, birds, soil organisms) attributable to soil degradation, herbicide, fertiliser and pesticide use, as well as the destruction of hedgerows and borders, all in the name of expanding large-scale arable monocultures intended for human consumption.

Another major issue with the big picture, globalised approach that occurs when scientists and policy makers get together in the manner of this Lancet Commission, is that they work with averages. In doing so, the subtleties, vagaries, mysteries and wonders of outliers are omitted from their analyses. Their lack of practical experience of such examples – whether it is the resolution of auto-immune conditions through the removal of certain types of plant food from the diet, or the restoration of marginal grasslands through the re-introduction of livestock – means they remain invisible.

Once an ideology takes hold – as is the case with concepts such as peak livestock and the perceived need to globally transition from animal to plant-sourced proteins (Harwatt, 2018) – momentum can gather quickly. If policy measures including taxes on foods deemed unhealthy or bad for the environment are imposed, the process of transition is likely to accelerate. In this case, it is essential that the approach – and the evidence that underpins it – is sound. In many cases, contrary to the bold assertions made by the EAT-Lancet authors, the data are far from certain.

The EAT-Lancet report, in effect, vilifies meat consumption. However, even accepting the arguments made, meat eating is not the problem *per se* – it is excessively cheap meat that is the problem, where the cost of the meat does not adequately take into account the true cost of its production in environmental terms. This includes how different types of animal production systems act as sources or sinks for greenhouse gases, or whether their net carbon footprints and the ecosystem services offered, including that related to the forage crops or feed that helped create the animals, have been adequately factored in.

If agro-ecological systems were to be valued for their reduced impacts on climate change, their contribution to biodiversity and reduced pollution, and in which livestock

were accepted as a necessary part of these systems, a degree of meat-eating, probably significantly over the levels contemplated in the planetary health diet, would probably be tolerable. But such approaches are completely counter to the kind of industrialised animal production methods that have become *de rigeur* through much of the world.

The westernisation, simplification and globalisation of diets is a massive issue for both people and planet. This process, that has swept across the world ever more rapidly over the last three or so decades, is being driven as much by industry and government, as it is by consumer demand. As emphasised by research on the five blue zone regions of the world, long, healthy lives are not associated with technological advancement either of food production or healthcare systems (Buettner and Skemp, 2016). The corollary is also true. Obesity, type 2 diabetes and the primary health burdens of the 21st century, are all associated with technological advancement. Traditional diets and agricultural practices are being forgotten at an astonishing rate as adoption of technology and urbanisation gathers pace in the so-called developing nations.

For the sake of people and planet, a major international effort is urgently required to compare the net harms and benefits of different strategies relating to food production systems and consumption patterns in different regions and countries. This should include comparisons between high-input, industrial-scale farming systems for plants and animals, against low-input, sustainable systems, based on agro-ecological, nutrient-cycling principles.

As suggested by Christine King (2008), these agro-ecological systems are about reconnecting people and food, and people with people – as well as helping to create community and health resilience. Fundamental to the viability and stability of these systems is their adaptation to local environments and cultures, and their resilience in the face of climatic, social and political instability.

Such considerations are of key importance given the deficiencies of the EAT-Lancet report and the rise of the corporatocracy (Vanbergen, 2016). Equally, full account needs to be taken of the social, environmental, economic and cultural impacts of current trend tendency for control of agricultural, food production and healthcare resources into the hands of a small number of transnational corporations (George, 2015; Hendrickson *et al*, 2017).

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